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BIOLOGICAL OBSERVATIONS OF GLASSY CUTWORM (LEPIDOPTERA: NOCTUIDAE) IN WESTERN OREGON

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Abstract.—The glassy cutworm, *Crymodes devastator* Brace, is a sporadic subterranean pest of grasses grown for seed in the Pacific Northwest. Light trap captures indicate that adult flight occurs from July through September, but peaks in late July. Postharvest field burning eliminates all foliage and crop residue, probably making fields temporarily unsuitable for oviposition. I suspect that females fly from burned fields to spring-seeded, green fields to oviposit. Bentgrass, ryegrass and wild oats, as weeds in fine fescue fields, attract ovipositing females. High densities of feeding larvae damage or kill the crop of fine fescue near weeds and become evident in late autumn. Larvae 1.5–2 cm long are present in fields during winter and readily initiate feeding after exposure to 21° C for 2 to 7 days in the laboratory. *Nowickia latianulum* (Tothill) and *Lissonota montana* (Cresson) collectively parasitized 30% and 48% of larvae collected from two field sites.

Key Words.—Insecta, *Crymodes devastator,* pest management, grass seed, insect parasites

The glassy cutworm, *Crymodes devastator* Brace, is a sporadic subterranean pest that feeds primarily on the roots and crowns of grass but also attacks many other hosts (Crumb 1929). Numerous reports document field infestations throughout the U.S. and Canada, but only scant biological information is available (Gillette 1891, Slingerland 1902, Rings & Arnold 1974). Various natural enemies attack the larvae, but their impact on the larval population has never been quantified (Coquillett 1897, Gibson 1915, Gillette 1891, Strickland 1921). No information is available on the seasonal appearance, development, and activity of larvae in fields of grass grown for seed in the Pacific Northwest.

This study determines: the seasonal development of larvae in relation to adult flight, the feeding behavior of larvae, the degree of larval parasitization, and the onset of diapause. Seasonal flight of adults was monitored, and oviposition by females was related to cultural practices of grass seed production.

Materials and Methods

The relative seasonal abundance of adults was determined with a light trap operated near Donald, Oregon. Eggs were obtained by placing adults in gallon jars containing corrugated wax paper to provide cover for the moths and also an oviposition substrate. Newly eclosed larvae were reared individually in stender dishes (5 × 2.5 cm) whose bottoms were lined with damp blotting paper. Larvae were fed freshly cut leaves of Chewings fescue (*Festuca rubra* var. *commutata* Guad) every 1–3 days, depending on the size of the larvae. Pupae were kept in stender dishes whose bottom had a 1 cm layer of moist peat. To estimate the degree of field parasitism, larvae 1.5–2 cm long were collected in November from commercial grass seed fields near either Peoria or Stayton, Oregon and reared as previously described. All larvae were reared in controlled-environment chambers

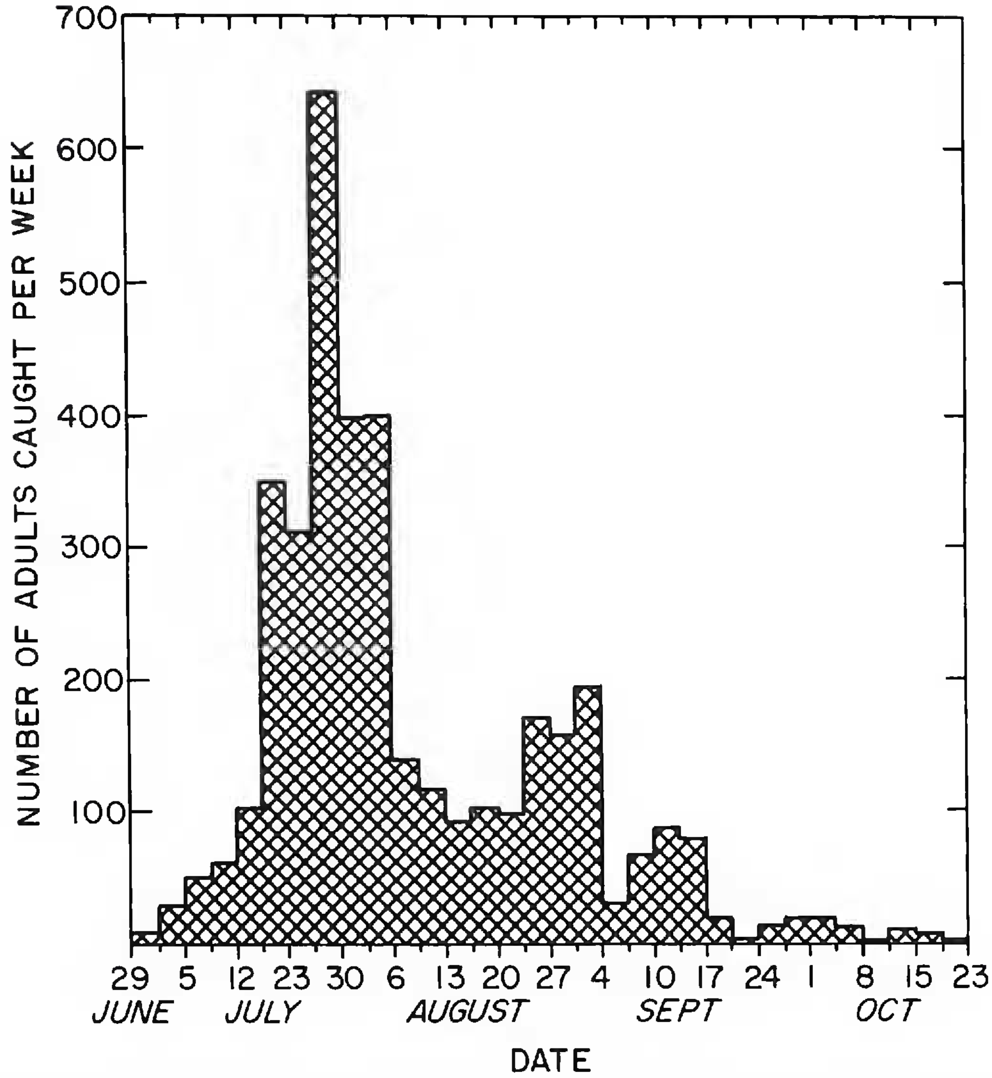

Figure 1. Seasonal abundance of glassy cutworm adults attracted to a light trap operated near a field of fine fescue.

at 20° C in a photoperiod of 16 h light, 8 h dark (LD 16:8) unless specified otherwise.

The fine fescue fields and weeds within were sampled to determine larval density in mid-summer and early autumn. Cores of crown and root zone (110 cm deep by 10 cm diameter) of individual fescue or weed plants were removed and dissected to determine larval numbers. Fine fescue plants were sampled when adjacent to, or 1 m distant from, various weeds in the field. The number of larvae was determined in 20 plants of each species sampled. The weed species were bentgrass (*Agrostis tenus* Sibth), ryegrass (*Lolium perenne* L. and *L. multiflorum* Lamarck), and wild oats (*Avena fatua* L.). Because some of the latter were sprayed with the

Table 1. Mean time (days ± SD) that larvae and pupae of *C. devastator* required to develop at 20° C when exposed to different photoperiods.

Photoperiod	Number of larvae	Development time	
		Larvae	Pupae
LD 16:8	47	102.9 ± 9.4[a]	23.2 ± 2.5[a]
LD 16:8 for 46 days, then LD 10:14	45	103.3 ± 17.6[a]	23.6 ± 2.8[a]
LD 10:14	49	126.8 ± 13.6	27.6 ± 2.9

[a] Larvae developed significantly faster compared with those exposed to the LD 10:14 regime (ANOVA, $P < 0.001$).

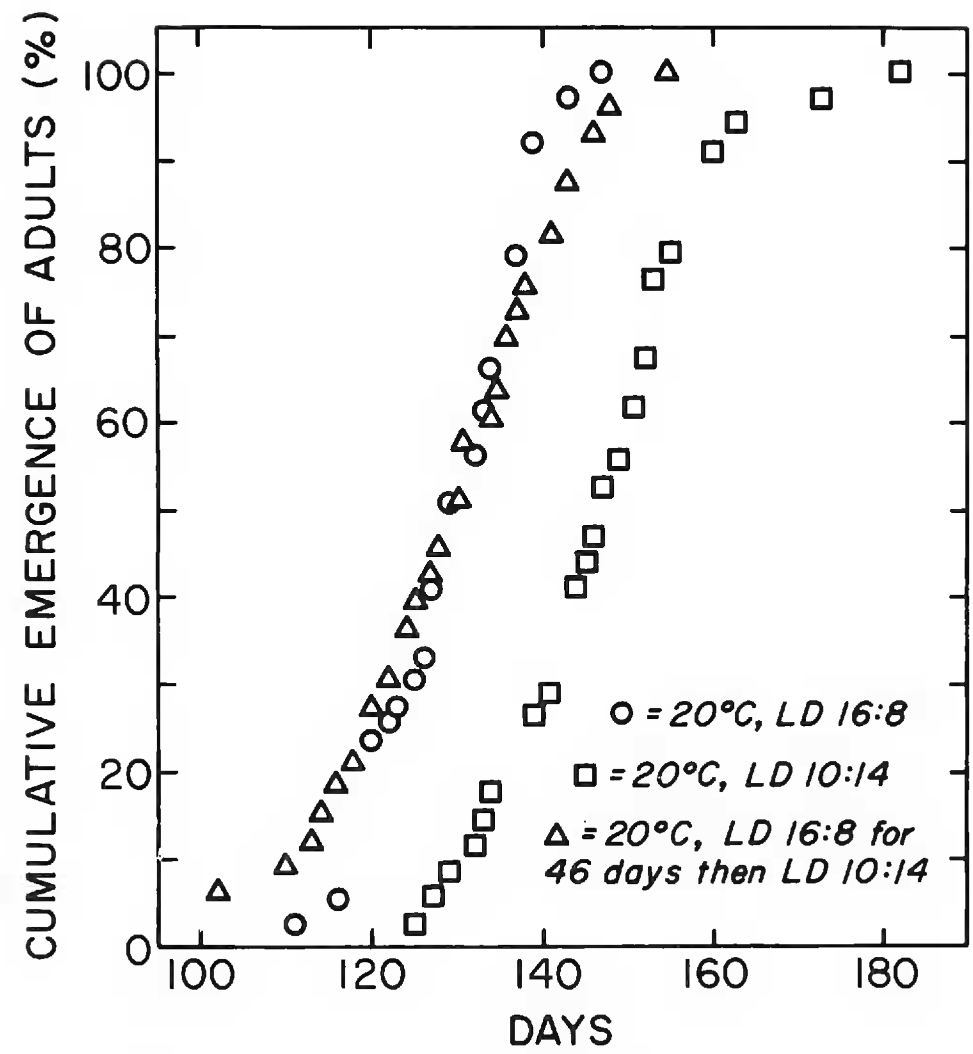

Figure 2. Cumulative emergence of adults reared in various environmental regimens in controlled-environment chambers.

herbicide glyphosate in mid-August, the numbers of larvae found on fine fescue plants adjacent to sprayed and unsprayed plants were recorded in October.

Results and Discussion

Light trap data show that glassy cutworm adults were present in grass seed fields from late June through September (Fig. 1). The seasonal abundance of adults indicates that adults are most numerous during July and early August, when spring-seeded fields of fine fescue are still green. At this time, older fields are usually covered with postharvest straw or carbon residue from the cultural practice of postharvest burning. Because the fire in burned fields moved rapidly and was short-lived, cutworm pupae and larvae in plant crowns or soil escaped injury. Upon emergence, adults are believed to fly out of burned fields into actively growing, spring-seeded fields in search of oviposition sites.

Larval development was studied in the laboratory to determine the effect of photoperiod on larval growth and diapause. Development proceeded at the same rate when larvae several days old were exposed to either long days (LD 16:8) or long days for 46 days followed by short days (LD 10:14) (Table 1). The latter regime shows that early instar larvae developed more slowly in response to short days; whereas, older larvae were not affected by the short-day regimen. Larvae exposed to short days required 23.9 days longer to reach the pupal stage compared with those exposed to long days. The cumulative emergence of adults is shown in Fig. 2. Assuming oviposition temporarily parallels adult flight, the size variation

Table 2. Number and percentage of parasitized larvae of *C. devastator* collected from commercial grass seed fields.

Date and location	Number of caterpillars	% parasitized	Parasites that pupated	
			Nowickia latianulum	*Lissonota montana*
18 Jan 1974 Peoria, Oregon	159	48	15	57
10 Dec 1981 Stayton, Oregon	168	30	14	36

of larvae infesting fields in the autumn is probably due to egg deposition over several months and to differential development of younger larvae exposed to the shorter day lengths of late summer.

Some lepidopteran larvae that diapause in the Willamette Valley of Oregon during winter may require a month or more to resume active development after return of favorable conditions (Kamm 1973). The duration and stability of diapause vary among insects and in some cases diapause is little more than a transitory delay in development (Beck 1980). When larvae of the glassy cutworm were taken to the laboratory from the field during December and January, active feeding began within 2 to 7 days. Larvae have also been observed to feed in the field during periods of unseasonably warm winter temperatures in the Willamette Valley.

Many of the larvae collected from two field locations were parasitized by the tachinid, *Nowickia latianulum* (Tothill), or the ichneumonid, *Lissonota montana* (Cresson) (Table 2). Parasitized larvae were nearly mature before they ceased feeding, and therefore it is doubtful that parasitization does much to reduce current season feeding damage by larvae. However, subsequent adult populations will be reduced according to the degree of parasitization in the larval population.

The distribution of larvae within a field of fine fescue indicated that significantly more cutworms were found on fine fescue plants adjacent to weeds (nonfescue grasses) than on fine fescue plants 1 m or more from the weeds (Table 3). When the postharvest practice of burning temporarily eliminates all foliage in established

Table 3. Number of glassy cutworm larvae found on fine fescue near various weeds compared with fine fescue 1 m from weeds (Stayton, Oregon, 13 Oct 1983).

Plant sampled	Weeds adjacent to fine fescue	Larvae/sample ($\bar{x}$ ± SD)
Fine fescue	None	0.70 ± 1.1
Fine fescue	Wild oats	4.00 ± 2.3[a]
Fine fescue	Wild oats (sprayed)	1.60 ± 1.9[b]
Bentgrass	—	3.85 ± 2.7[a]
Fine fescue	Bentgrass	2.10 ± 1.6[a]
Ryegrass	—	1.25 ± 1.5[b]
Fine fescue	Ryegrass	5.00 ± 2.6[a]

[a] Significantly more larvae present compared with fine fescue 1 m or more from weeds (ANOVA, $P < 0.001$).

[b] Not significant.

fields, females fly from burned fields to spring-seeded fields where green plants are available for oviposition. The concentration of larvae on or near weeds suggests that adults use these weeds for oviposition. Some larvae remained on perennial ryegrass and bentgrass weeds but abandoned the annual wild oats upon senescence. Also, fewer larvae were found on fine fescue plants adjacent to wild oats that were killed with glyphosate compared with the number of larvae found on plants adjacent to the unsprayed wild oats. Thus, early control of weeds reduced the concentration of cutworms on fine fescue near nonfescue grassy weeds. Often the fescue within a radius of 30–40 cm of living wild oat plants not treated with glyphosate sustained considerable damage or was killed by feeding larvae in late autumn. Other cutworm species are known to prefer weeds to crop plants for oviposition (Busching & Turpin 1976).

Infestations may result in near elimination of crop plants within 20–30 cm of weeds. Because the nonfescue grasses are often 30–80 cm taller than the fine fescue in mid-summer, the taller plants may attract females. Regardless of the reason for the concentration of larvae near weeds, control of weeds during early summer reduced the concentration of larvae and feeding damage to the fine fescue.

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